

U.S. Patent Application Serial No. 10/532,249
Amendment filed April 4, 2008
Reply to OA dated January 8, 2008

REMARKS

Claims 1-23 are pending in this application. Claims 1-3 are amended herein. Upon entry of this amendment, claims 1-23 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is detailed below.

Claims 1-3 are objected because of the informalities. (Office action paragraph no. 1)

The Examiner objects to the wording “the other circuit of the semiconductor device,” stating that there is no antecedent basis for this. These phrases in claims 1-3 have been amended to read -- another circuit of the semiconductor device--, thereby using an indefinite article.

Claims 1, 4, 5, and 9-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. ‘094. (Office action paragraph no. 3)

Claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. ‘094, and further in view of Adkisson et al. ‘202. (Office action paragraph no. 4)

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Claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. '094, and further in view of Kim et al. '371.
(Office action paragraph no. 5)

Claim 7 is rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. '094, and further in view of Greenwald et al. '026. (Office action paragraph no. 6)

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. '094, and further in view of Yamawaki et al. '774. (Office action paragraph no. 7)

Claims 13-18 and 20-22 are rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. '094, and further in view of Li '254. (Office action paragraph no. 8)

Claims 19 and 23 are rejected under 35 U.S.C. §103(a) as being unpatentable over Takeshi et al. (Abstract JP 8186235) in view of Mirkarimi et al. '094, further in view of Li '254, and further in view of Lee et al. '705. (Office action paragraph no. 9)

These rejections are overcome by the amendments to claims 1-3. In the first step of each of these claims, the recitation “forming” has been amended to --epitaxially forming--. Support for this amendment may be found in the specification on page 7, third paragraph, of the specification, and in Example 1 (page 10, line 30).

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Takeshi et al. cited by the Examiner, which relates to a DRAM, does not disclose a ferroelectric thin having a plane (111) in parallel with the surface of a substrate.

On the other hand, the Examiner has stated that Mirkarimi et al. '094 teaches a ferroelectric memory device wherein the ferroelectric thin film has a (111) orientation. In Mirkarimi et al., there are stacked, on a silicon substrate 12, an interlayer insulation film having plugs 16, a diffusion barrier 18 on the plug, a bottom electrode 20, and a dielectric layer 22, as can be seen in Fig. 2. Thus, in Mirkarimi et al., the preferential orientation (self-orientation) of the barrier film and bottom electrode in the (111) direction is used, so that a dielectric (ferroelectric) film is formed on the bottom electrode so as to be oriented in the (111) direction. In such a case where a sublayer for a ferroelectric film is formed using its preferential orientation, the sublayer is highly oriented in the direction perpendicular to the surface thereof, but randomly oriented in the direction parallel with the surface of the sublayer. As a result, the ferroelectric film formed on the sublayer (the bottom electrode 12 in Mirkarimi et al.) is also randomly oriented in the direction parallel with the surface of the sublayer. In other words, the ferroelectric film in Mirkarimi et al. is uniaxially oriented.

In claims 1-3 of the application as amended herein, the film or films (the ferroelectric film, or the buffer film and ferroelectric film) between the substrate (the single crystalline substrate) and the electrode of a capacitor or part of a circuit of a semiconductor device are **epitaxially** formed. Using the epitaxial growth, a ferroelectric single crystalline thin film is formed on the substrate, the film having a plane (111) in parallel with the surface of the substrate, and the crystal axes of the film in parallel with the surface of the substrate being unidirectional, and the crystal axes of the film

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perpendicular to the surface of the substrate being also unidirectional. Thus, the film or films in question are biaxially oriented.

Applicant therefore submits that claims 1, 2 and 4-23 are not obvious over Mirkarimi, Takeshi, Adkisson, Kim, Greenwald, Yamawaki, Li, and Lee, taken separately or in combination. Reconsideration of the rejections is respectfully requested.

Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. (Office action paragraph no. 15)

Reconsideration of the objection is respectfully requested in view of the amendment to claim 1, which overcomes the rejection of claim 1.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, the applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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